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PLAN FOR INTERIM MEASURE PHASE 2 UPGRADES AT SITE 11 NSB KINGS BAY GA
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**PLAN FOR
INTERIM MEASURE PHASE II UPGRADES**

**SITE 11, OLD CAMDEN COUNTY LANDFILL
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA**

Unit Identification Code: N42237

Contract No. N62467-89-D-0317/094

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March 1996

PLAN FOR INTERIM MEASURE PHASE II UPGRADES

On behalf of Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) and Naval Submarine Base (NSB), Kings Bay, Georgia, ABB Environmental Services, Inc. (ABB-ES), is pleased to present this Plan for Interim Measure (IM) Phase II Upgrades. This Plan has been prepared to summarize Navy's plans for upgrading the existing IM groundwater extraction system at Site 11, the Old Camden County Landfill, located on the NSB. This Plan for Phase II Upgrades focuses on improving the existing Phase I IM system in order to more efficiently contain migration of the contaminant plume containing volatile organic and semivolatile organic compounds in the groundwater beneath the western boundary of Site 11.

This Plan outlines the conceptual design and schedule proposed to meet Phase II IM objectives. Included in this Plan is a brief review of the Interim Measure (IM) concepts and Phase I objectives, objectives for the proposed Phase II activities, a conceptual description of the upgrades proposed for the groundwater extraction (GWE) and treatment systems, and several tasks identified to be completed as part of a Performance Evaluation Plan (PEP). This work has been performed under contract to the U.S. Department of the Navy (Navy), Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) within the Comprehensive Long-term Environmental Action, Navy (CLEAN) program, Contract No. N62467-89-D-0317, Contract Task Order No. 094.

PROJECT REMEDIATION TEAM

The Plan described herein has been assembled through a collaborative effort by Navy's Remediation Team. This team consists of ABB-ES, the United States Geological Survey (USGS), and the Naval Facilities Engineering Service Center (NFESC) Cleanup Review Team (CURT). The CURT is a team of environmental technology specialists from the Navy, Army, industry, and academia whose mission is to review existing remediation scenarios and assist Navy's consultants and technical experts with the process of improving remediation technologies and efficiencies.

The recent efforts of the Remediation Team have culminated in the production of this Plan for Upgrades. Navy views this Plan as one significant step in a several-step process to reach our ultimate goal of preparing a Final Corrective Action Plan (CAP) for site cleanup. Once this plan is implemented, further analysis of the operating effectiveness will be performed and the corrective measure study and Final CAP processes will begin whereby final remedies can be evaluated and recommended. Other significant steps which are part of this process is Georgia Environmental Protection Division's (GAEPDs) review and concurrence with the Supplemental RCRA Facility Investigation (SRFI) Report which presents the extent of contamination, and the negotiation of preliminary cleanup standards.

A REVIEW OF THE INTERIM MEASURE CONCEPT AND PHASE I OBJECTIVES

The Interim Measure approach to site remediation was selected by Navy and GAEPD when site investigations at Site 11 identified that volatile organic compound (VOC) contaminants were present

within the surficial aquifer and had migrated laterally westward toward the subdivision. The IM approach was used as a means to quickly install a partial remedy which would, at the least, prevent offsite flow of contamination from worsening. More specifically, Phase I objectives were to hydraulically control movement of the most contaminated portions of the VOC plume within the surficial aquifer along the western portion of the landfill using a groundwater extraction system. The IM Work Plan (ABB-ES 1994a) presented IM Phase I objectives and activities, and included the rationale for the potential need for these Phase II considerations.

Once the IM system was installed and functional, Navy would evaluate the system's effectiveness in meeting IM objectives, and if necessary, Phase II upgrades would be recommended. Concurrent with IM activities, the Navy has been performing remedial investigation activities to assess the nature and extent of contamination. Findings from this investigation activity are currently in draft form in a SRFI Report that will be issued to GAEPD for review and comment. This Plan for Upgrades is the end-product of the recent efforts to estimate the effects that the IM system has on groundwater flow at the site. Areas where the system's effectiveness can be increased have been identified and Navy will implement these upgrades in the coming months. The SRFI Report will be used to work with GAEPD to identify other areas of concern in and around the landfill, and form the basis for establishing preliminary cleanup goals. Once contaminants and media of concern are finalized through the SRFI Report review process, and potentially the risk assessment process, preparations of a Final CAP can be initiated which will include a corrective measures study to identify and evaluate remedial technologies appropriate for the site.

PURPOSE OF THE IM PHASE II UPGRADES

The purpose of this Plan is to present recommended upgrades to the Phase I IM GWE and treatment system. The proposed system upgrades are designed to improve the ability of the existing system to effectively contain VOC and semivolatile organic compound (SVOC) contaminant migration along the western boundary of Site 11 and provide interim remediation of VOC and SVOCs in the groundwater beneath Site 11. Previous reports (see reference list at the end of this Plan), comprehensive monitoring event data, and existing data from the ongoing operation of the Phase I system, were reviewed and evaluated to develop the recommendations for upgrades to the existing system.

Remedial objectives for the Phase II upgrades were developed on:

- o review of chemical concentrations at monitoring well KBA-11-13A which has shown consistently elevated contaminant concentrations;
- o an area between RW-1 and RW-2/5 where flow of contaminated groundwater from the landfill may not be directed toward the recovery wells;
- o a review of well efficiency data which indicates low efficiencies in the existing recovery wells; and

- o a comprehensive technical project review conducted by the Navy CURT and the USGS which supports the recommended upgrades presented herein.

The primary objective of the IM is to minimize the further migration of site-related contamination thereby reducing the contaminant's imminent threat to human health and the environment. This objective will continue to be achieved in incremental measures followed by performance evaluations and recommendations for further measures. Upon GAPED approval of the SRFI Report and establishment of cleanup goals, long-term corrective measures can be implemented.

SCOPE OF THE IM PHASE II UPGRADES

The Remediation Team, with the assistance of GAEPD comments provided over the past several months, has identified areas where the existing IM system could be improved. These areas include:

- o redevelopment of the five existing recovery wells to address the observed recovery well inefficiencies;
- o installation of one additional recovery well and associated conveyance, power, and equipment to more aggressively attack contaminated groundwater in the most affected area; and
- o development of a comprehensive Performance Evaluation Plan to collect chemical and hydrologic data from which the effects of the IM system can be more fully understood and to use in evaluating long-term remedial technologies and prepare a Final CAP for Site 11.

A two-task approach has been developed to implement the scope of the upgrades Plan. Activities under Task 1 will include:

- o recovery well redevelopment;
- o pulsed-pumping test to evaluate surging stresses on contaminant removal efficiency;
- o data collection and evaluation of tidal, seasonal, and climatic trends, pre-stressed and stressed potentiometric surfaces, and aquifer heterogeneities;
- o preparation of a Performance Evaluation Plan to measure the success of the existing system and evaluate other site conditions and the potential applicability of other remedial alternatives such as intrinsic or enhanced bioremediation.

Task 2 activities will include:

- o installation of an additional recovery well in the area of highest known contamination (near KBA-11-13);

- o installation of additional monitoring wells with which to assess system performance and optimize the quantities of water pumped from individual wells.
- o implementation of the PEP.

CONCEPTUAL DESIGN FOR IM PHASE II UPGRADES

The recommended upgrades include the redevelopment of the five existing recovery wells, addition of one recovery well to the existing system, addition of several performance monitoring wells (the number and placement of which will be provided in the Performance Evaluation Plan to be prepared by the Remediation Team), and associated design and installation of power, conveyance, and treatment system modifications resulting from the system upgrade. The details, final specifications, and construction methods of the upgraded IM will be contained in an IM Upgrades Design Package.

Conceptual Design Basis and Logic. Analytical data from comprehensive monitoring events conducted in January 1994, April 1994, September 1994, and April 1995 showed the highest levels of contamination at monitoring well KBA-11-13A. Table 1 summarizes the detected contaminants in KBA-11-13A from the most recent monitoring event in April 1995.

FLOWPATH modeling from the Phase I IM Evaluation and Recommendations Report also indicated that there may be an area between RW-1 and RW-2/5 which is not being directed toward any of the existing recovery wells, possibly allowing off-site migration of contaminants.

Because the area of KBA-11-13 is the only area identified as a "hot-spot" due to the concentrated nature of contaminants, an additional recovery well in this location would more aggressively and efficiently remove contaminants from the aquifer. A secondary benefit of placing an additional recovery well in this area is that the increased pumping would effectively reduce the potential for groundwater to pass through an area of the aquifer where individual capture zones created by each recovery well may not overlap. This additional recovery well, combined with existing recovery well redevelopment, should remove any uncertainty concerning this passage of groundwater between capture zones.

Groundwater Extraction. Groundwater will continue to be extracted using the existing recovery system which will be upgraded by redeveloping the existing recovery wells and adding one additional recovery well in the vicinity of KBA-11-13A.

Recovery well redevelopment may improve well efficiencies resulting in an increased specific capacity (discharge per foot of drawdown in the well), thereby providing the option to increase extraction rates in order to increase the size of the capture zones. The additional recovery well will also provide the means to increase total groundwater extraction rates thereby increasing the capture zone. Current plans are to increase the capture zone size, reducing the potential for slip-through, by adding one additional recovery well and simply operating the existing recovery wells at the same discharge but increased efficiency during future operations. The redeveloped wells should have the capacity to allow increased extraction rates should this be desirable in the future.

TABLE 1

DETECTED CONTAMINANTS IN GROUNDWATER FROM KBA-11-13A
APRIL 1995 SAMPLING EVENT

Analyte	Concentration (ug/l)
1,1-Dichloroethane	3
1,1-Dichloroethene	0.4 J
Benzene	4
Carbon Disulfide	0.2 J
Chlorobenzene	2
trans-1,2-Dichloroethene	11
Ethylbenzene	120
4-Methyl-2-pentanone	4 J
Tetrachloroethene	1300
Toluene	75
Trichloroethene	790
Vinyl chloride	53
Xylene (total)	260
cis-1,2-Dichloroethene	440
p-Dichlorobenzene	1 J

J=estimated value

The redevelopment activities will focus on clearing the well of mineral precipitation, biological growth, and fine-grained material from the formation and any bentonite that may have been left behind from the drilling fluids. These activities will include:

- o removing all down-hole equipment and verifying total depth of the well;
- o flushing with an acid to remove mineral buildup and biological growth;
- o flushing with liquid catalyst dispersant to remove biological growth and suspended fine-grained material from the filter pack, the formation, and any bentonite that may have been left behind from drilling;
- o mechanical surging while monitoring pH; and
- o pumping to remove sloughed-off and detrital material from the well.

Groundwater Conveyance. Extracted groundwater will continue to be conveyed to the treatment system by an underground piping system. A separate conveyance line will be installed from the new recovery well with valving, control, and flow-measuring devices similar to those for the Phase I IM system. The newly installed conveyance lines will be manifolded into the existing system at the treatment system compound.

Groundwater Treatment. Phase I monitoring of the groundwater flowstream prior to the treatment system has detected only VOC contaminants above Federal Maximum Contaminant Levels (MCLs). This monitoring supports continued use of the existing treatment system, a diffused aeration tank (DAT), with a blower to provide aeration to the unit, for IM Upgrade activities. An engineering evaluation will be performed to determine if the existing unit is adequate to handle the increased hydraulic and contaminant loading generated from the increased influent. The engineering evaluation of the DAT to handle the increased loading will require evaluation of a number of factors. The combined flow and contaminant concentration from all recovery wells will be estimated using historical operating and monitoring data. To properly evaluate the capacity of the DAT, the anticipated average and peak contaminant concentrations will be considered. The efficiency of the air stripping system will continue to be monitored by collecting water effluent, water influent, and discharge air samples on a scheduled basis. This sampling schedule will be proposed in an engineering performance monitoring plan.

Discharge of Treated Water. The Navy has been authorized by GAEPD to discharge treated groundwater to the NSB land application system (LAS) which currently permits the system to discharge a flow rate of 86,400 gallons per day (gpd). The projected maximum flow for the IM Upgrades is 46 gpm which would be equivalent to 66,240 gpd. The actual design flow rate will be better determined following redevelopment of the existing recovery wells. The upgraded system will be designed to continue to meet effluent requirements as described in the Request for Authorization for groundwater Discharge into the NSB Kings Bay LAS (ABB-ES, 1993d) and the modification submitted on October 6, 1994, and approved by GAEPD on December 5, 1994. The groundwater discharged to the LAS influent from the Upgraded IM system should meet Federal drinking water criteria (MCLs) (U.S. Environmental Protection Agency [USEPA], 1995).

Off-Gas Treatment. Prior to the installation of the IM system at Site 11, GAEPD determined that a permit would not be required. The exemption was based on Georgia Rule 391-3-1-.03(6)(g)2. Although no permit was required, Phase I IM activities were subject to additional ambient air emission limitations approved by GAEPD for protection of human health and the environment. An emission limit of 0.37 milligram per cubic meter (m/cm) for vinyl chloride was established. This limit was based on SCREEN modeling, Ambient Air Concentrations (AAC) determinations, and additional safety factors (ABB-ES, 1994a). Vinyl chloride was chosen as the indicator compound for compliance due to the toxicity of this compound.

The existing treatment system includes carbon adsorption units to remove volatiles in the vapor off-gases from the air stripper before discharge of the vapor stream to the atmosphere. Historical air sampling data (provided in 1994 and 1995 SOUTHNAVFACENGCOM bimonthly reports for the Phase I IM system operation [ABB-ES, 1994e]) indicate that continued treatment of off-gas may not be necessary. Based on a limit approved by GAEPD of 0.37 m/cm for vinyl chloride emissions, an engineering evaluation will be conducted to determine the need for continued treatment of off-gas emissions.

PERFORMANCE MONITORING

The Remediation Team has been tasked by Navy to prepare a Performance Evaluation Plan (PEP) which will have the following scope:

- o installation of several monitoring wells in the areas most affected by contamination to better assess IM system performance;
- o installation of monitoring wells in additional strategic locations to assess the potential for groundwater and contaminant flow in other directions from the landfill;
- o a comprehensive sampling and analytical program to characterize cleanup efficiencies from a contaminant perspective;
- o incorporation of investigative tasks to better evaluate other remedial technologies such as natural biological attenuation or in-situ bioremediation with engineered assistance.

In addition to this PEP, Navy has already commissioned the completion of a pulsed-pumping test to evaluate the potential that this technology could increase contaminant extraction efficiencies. This test will include monitoring aquifer response to pulsed stresses as the recovery wells are turned on and off. This will increase our understanding of the groundwater characteristics and prepare for evaluation of long-term corrective measures. In addition to the collection of groundwater elevation data, several rounds of groundwater samples will be collected for chemical analysis. This will provide needed information for assessing plume movement characteristics during pumping.

SCHEDULE

Several concurrent activities are being performed by Navy and its Remediation Team. Several activities are near completion at this time, and include:

- o preparation of the IM Report Addendum which provides additional development of concepts, data analysis, and clarification to the November 1994 IM Evaluations and Recommendations Report, and which should be available for GAEPD review by the end of April 1996;
- o preparation of the Draft Final SRFI Report.

Other activities that will be performed, in the order that they will most likely commence, include:

- o preparation of the Performance Evaluation Plan;
- o preparation of the IM Phase II Upgrades Design Package;
- o submission of the IM Report Addendum;
- o a pulsed-pumping test;
- o submission of the SRFI Report;
- o recovery well redevelopment
- o construction of IM Phase II upgrades;
- o determination of preliminary media cleanup standards (possibly involving a risk assessment);
- o implementation of the PEP and commencement of corrective measure study and Final CAP activities.

Navy will be initiating the tasks in this Plan that are not already underway, in April 1996. Preparation of the PEP will begin in April as will the procurement process for redeveloping the recovery wells and design of the recovery well installation and treatment system upgrades. The additional recovery well should be installed and pumping by the end of 1996, and implementation of the PEP will be underway once the new pump is turned on. The pulsed-pumping test is scheduled to be performed in April 1996.

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